

Interactive comment on “Spatial variation of shallow and deep soil moisture in the semi-arid loess hilly area, China” by L. Yang et al.

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We thank Anonymous Referee #2 for contribution and insightful comments and suggestions on our manuscript. We have gone through all the comments and will amend the original manuscript base on the comments and suggestions. We would like to take this opportunity to answer his/her questions and explain our points of view:

Reviewer: The logic and structure of the paper are sound, however, a native English speaker should be asked to edit the paper.

Authors: Thanks for comment and suggestion, we have paid more attention to the problem and make efforts to improve the English. The revised manuscript will be revised by

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a native English speaker before submission.

Reviewer: I would appreciate some pictures to show the study transects.

Authors: Some photos of the study transects will be added in the revised manuscript.

Reviewer: I agree with the comments posted by other referee. Some research questions such as how the environmental variables affect SMC could be answered better through canonical correspondence analysis.

Authors: Thanks for good suggestion. We agree that more insight is needed regarding the relationships between SMC and environmental variables. Combined the suggestions of reviewers, canonical correspondence analysis will be implemented in revised manuscript.

Reviewer: Why shallow SMC samples were taken from April to August, while the deep SMC were only taken in August?

Authors: In the Loess Plateau, soil moisture in shallow layers varies inter-annually due to variation of annual precipitation. The previous studies have found that soil moisture vary with rainfall only in depth less than 2 m. Soil moisture content in deep layers keeps stable for several years. Thus, we used the temporal-averaged shallow soil moisture content data obtained from April to October to provide accurate characterization of the temporal changes in soil moisture content and represent the soil moisture conditions in shallow layers. Because the deep soil moisture content was relatively stable during years, the one-year deep soil moisture data obtained in August is sufficient in reflecting the stable soil moisture conditions in deep profiles.

Reviewer: Authors indicated “There were three separate sampling sites in each transect on the upper, middle and downhill slope”. So the total sampling sites should be 3 sites *8 transects. Please state in the method section, among these 24 sites, how many sites for each group, and how many sites for each land cover type in each group? (“six groups of NG, PO, AF, AL, KP on different slope aspects were selected to com-

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pare SMC affected by the slope aspect.” And “four groups of NG, AL, CP, and CA forestland in different slope gradients were selected to compare the SMC affected by slope gradient”).

Authors: In this study, soil moisture data were divided into three groups to study the spatial variation of shallow and deep soil moisture. First, the observed data in Group 1 (including eight transects of NG, PO, AF, AL, KP, CP, CA, and SA) was used to compare soil moisture content on different slope positions, and the total sampling sites in this group is 3 sites *8 transects. Second, observed data in Group 2 (including six sub-groups of NG, PO, AF, AL, KP1 and KP2) was used to compare soil moisture content on different slope aspects, and the total sampling sites in this group is 2 sites *6 groups. Third, observed data in Group 3 (including four sub-groups of NG, AL, CP and CA) was used to compare soil moisture content in different slope gradients, and the total sampling sites in this group is 3 sites+3 sites+2 sites+2 sites. Soil moisture data of some sampling sites were simultaneously used in Group 1, Group 2 or Group 3. For example, the site “PO-U” and “PO-Sunny” is the same sampling site, and the site “KP-M” and “KP1-Sunny” is also the same sampling site. Because of this reason, the total sampling sites is 39. Combined the suggestions of reviewers, the method section, Fig. 1 and table 2 in the original manuscript will be reorganized to clearly state how many sites for each transect/group.

Reviewer: A total of 30 soil samples were collected form each sampling point in August for the deep SMC. I wonder how many soil samples were collected in each sampling point from April to July for the shallow SMC?

Authors: Shallow soil moisture content data was collected biweekly from April to October of 2009 and April to September of 2010. The total field sampling times is 26. At each sampling time, 10 soil samples were collected at each sampling point. Furthermore, three sampling points were chosen to obtain the average soil moisture content each sampling time at each experimental site. Thus, the number of soil samples collected in each experimental site is $26 \times 10 \times 3$. The temporal- and depth-averaged shallow

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SMC is calculated by using these soil samples. Combined the suggestions of reviewers, the method section will be reorganized to clearly state how many soil samples were collected in each experimental site.

Reviewer: “The depth-averaged SMC of each experimental site at each measuring time was calculated by Eq. (1). . .” Authors indicated earlier that they have taken samples from three sampling points from each site. But the equation one did not indicate the average of three sampling points, so the authors cannot say that equation is for the experimental site. It should be the depth-averaged SMC of each experimental point instead.

Authors: Thanks for this comment and suggestion, we have paid more attention to the problem. The Eq. (1) is indeed the depth-averaged SMC of each experimental point. We will correct the improper formulation and adjust this section in revised manuscript.

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